

EPC or EPCM?

When it comes to contract strategies for major projects, Engineering, Procurement and Construction (EPC) and Engineering, Procurement, Construction and Management (EPCM) style contracts are two of the key options, but which one provides better outcomes for project owners? EPC and EPCM contracts can both deliver strong outcomes; however careful consideration should be made of the different levers and potential outcomes to determine which one is best for each project. In this article Rashid Hussain explores some of the key dimensions project owners should consider in choosing their project contracting strategy.

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Engineering, Procurement & Construction (EPC) is a contract option in which the EPC Contractor is

responsible for all activities from design to procurement and construction to deliver the asset to the end user or owner. It' is also known as Design and Construct (Lump Sum Turn Key is a form of EPC). Engineering, Procurement, Construction & Management (EPCM) is a professional services appointment whereby the Contractor's services are generally to provide detailed design, procurement, construction management and project coordination necessary to deliver a project.

Why Choose EPC?

EPC contract forms are selected to realise the inherent advantages provided by an integrated team across the full life cycle of a project from design concepts through to commissioning. Traditional barriers between engineering, procurement and construction contractors (or variations of this) are eliminated and the inefficient layering of owners' management teams is avoided enabling rapid and efficient decision and approval processes. This approach seeks to achieve the most seamless delivery organisation possible. An integrated EPC team can design, procure and construct facilities safer, in a

shorter duration and with lower cost in a manner fit for the purpose specified by the owner. Budget, schedule and performance risks are transferred from the Owner to the EPC Contractor, enabling the owner to focus on the critical task of developing their business systems and processes in preparation for operating their asset.

As challenges of projects become more complex, owners can transfer risk to a company capable of delivering a complete package of resources, products, innovations and management. In addition to the above, owners routinely expect contractors to provide contemporary industry efficiencies, latest tools and practices, labour relations expertise and risk management. An EPC approach allows these deliverables to be managed under one aligned team.

We believe that the EPC approach is responsive to the critical success factors for new project development, such as:

- Creating and maintaining the highest safety standards
- Mandating and achieving an aggressive completion
- Schedule
- Integrating quality into the work from conceptual design through the final installation
- Delivering a completed project fit for purpose and at the least capital cost

Why Choose EPCM?

EPCM contract forms were traditionally

used to enable a project to progress when the scope was unclear or a risk difficult to quantify such that a contractor required to include excessive contingent allowances in the price to address the risks. These included:

- New or proprietary technologies
- Specific site or country risks
- Owner supplementing their existing delivery team

This framework has shifted in the last 10-15 years such that the EPCM approach is now prevalent, initially driven by contractors becoming more sophisticated in their risk analysis and proposing a risk-free margin. Factors that influenced this transition were:

- Surge in demand for global engineering and construction and ability for contractors to nominate risk free revenue
- Significant size and complexity of projects such that contractors could not accommodate fixed price risk on their balance sheet.
- Shortage of experienced professionals to perform the work. During this transition period an "industry" of Owner Representative companies has developed to act as the interface between the Owners and Contractors and these organisations will continue to actively promote EPCM contracts to ensure the commercial viability of their business.

EPCM contracts allow critical path

activities to continue while scope is further defined. Schedule is therefore shorter as time taken to develop basic design is not added to the critical path. It is touted that EPCM project costs are less than EPC as the contractor's fee is minimised, however the inefficiencies of layering and bureaucracy of decision-making processes in EPCM result in inefficient organisation for an extended time and higher costs result. Also, the risk remains with the client and recent performance history indicates

owners are being impacted by the advice of their representatives.

In summary, EPC is the most direct route to the least cost and highest quality contracting option, where aggressive completion schedules and commitment to peak safety standards complete the mix. The inherent accountability of an integrated EPC team naturally delivers value, and the customer realises a product that is both fit for purpose and delivers the highest return on their investment.

A Comparison between EPC and EPCM Modes of Contracting

Project Allocation	EPC	EPCM
Equipment supply and process warranties	Single warranty between Owner and EPC Contractor, usually in the form of a performance bond. EPC Contractor manages warranties with sub-contractors and suppliers	Owner negotiates warranties with each supplier and contractor directly often supported by multiple performance bonds.
Project Budget Cost overruns	The cost risk for the project is borne by the EPC Contractor	The cost risk for the project is borne by the Owner
Project Financing	Usually requires a substantial down payment by Owner to EPC Contractor generally requiring all financing to be in place at onset of project	Project financing can be any combination of down payment, accounts and/or letters of credit from Owner to different suppliers.
Performance Risk	EPC Contractor provides a single point of accountability for performance and warranty of project execution; responsible for all risk provided by contract documents (e.g. schedule, cost and quality, as well as other requirements, specific to the process, location or customer)	A common perception is that with EPCM the risk is sublet to each individual contractor by Terms and Conditions and financial hammers such as liquidated damages, although many claims focus on who influenced performance (or who owns the risk). A Project manager of prime contractor may be hired as an agent of the owner, yet unless expectations are clear, risk-sharing becomes indistinct
Accurate and timely measurement of performance	With a single contractor a uniform set of tools can be applied to record and measure performance. Reporting tools can be integrated across the project for attributes such as schedule, cost, materials, labour and quantities which enhances accuracy through an interactive database.	Depending on the size and capability of each contractor, the tools used to measure and record performance can vary from logbooks to highly automated systems. If accurate and timely performance reporting is expected, the issue rests with who bears the cost to conform these assorted tools into a consistent report for the Owner or Project Manager

Performance Incentives	From an owner's perspective there is an advantage to selecting a contractor willing to place fee at risk based on performance incentives. With EPC this can include specific milestones along the execution path such as first concrete, mechanical completion or energization but can also capture global components such as safety, cost quality and schedule	Each contractor can and should be prepared for incentives related to their specific scope of work, plus any global components such as safety, cost, quality and schedule. Incentives will be successful if they are designed to reward a contractor for exceeding expectations while penalising the same for not performing to specific goals.
Criticality of project completion schedule	One of the key benefits with EPC is that the construction cycle can begin concurrently with detailed engineering. This significantly reduces the cycle time to construction completion and allows the duration from conceptual planning to an operating facility to be condensed. As a result, schedule critical projects are best suited for an EPC application.	A hindrance to schedule compression under an EPCM profile involves the Bid-Evaluation-Award (BEA) cycle associated with construction contracts. An effective and thorough BEA cycle consumes about 6 to 8 weeks and cannot begin until detailed design is substantially complete. If the BEA cycle is compromised, schedule compression is possible however project costs will suffer as a result.
Construction work packaging	Work packaging or a single EPC Contractor can readily adapt to many forms, typically driven by scope, discipline or schedule of work. An EPC enables the team to plan the work based on the most efficient menu and sequence for prefabrication, modules, installation and start-up.	Work packages for contractors must be divided into groups based on both scope and commercial content i.e. the ability to attract a cohesive set of bids for evaluation. This may not always reflect the optimum installation process, and can also develop a rigid work process that fosters change orders from poor definition of subdivided work.
Communication of Construction issues and changes	Construction progress, information and experience flows quickly to other team members under an EPC approach. Problems are solved rapidly and results are available sooner as the interface between the E, P and C functions is connected. Cycle times are reduced and many traditional issues never occur as the team works daily as a cohesive unit.	Traditional construction contracts bind communication with formal protocol, where changes, issues and reports are accompanied with written transmittals. This provides a highly accountable record of events through the project but drives cycle time between questions and answers to lengthy intervals, It can also prevent good ideas from fruition as they get lost through paperwork.
Ratio of administrative, technical & supervisory personnel to specialists	For a project where a single contractor is responsible for EPC, the ratio of field non-manual to specialists should be 15% to 20%. This includes all site personnel such as clerks safety personnel, field engineers, QA/QC inspectors, specialist supervisors and site management. In many cases, non-manual employees can fill multiple roles, reducing the overall staffing number and associated costs.	The ratio between field non-manuals and specialists for each contract should fall within a similar bandwidth as for EPC, however between the contractor and owner (or prime) there is often duplication in management and administration. This results in a much higher cost for the larger staff, typically required to fill the void between performance reporting and contractor accountability.

Material Supply Cycle	Procurement of engineered components, equipment and bulk materials can be performed on a schedule best suited for fabrication, delivery, installation and testing. Considerations for commitment and cash flow are built into the procurement plan, and control of materials is maintained by a single source through-out the project life. Leveraged buying provides further cost savings.	Typically the owner of EP Contractor procures engineered components and equipment for EPCM projects with bulk materials supplied by either the individual contractor or available to all contractors on a consignment or stock basis. Material control becomes more complex and delays can lead to change orders or claims. Leveraged procurement does not apply well to an EPCM profile.
Modularisation of components and equipment	Modularisation of plant components and equipment should be determined by availability of qualified fabrication shops, routes of transportation and site specific conditions such as weather and terrain. An EPC contractor can review module design during the constructability process, to assure that effective integration of module issues and logistics.	If modularisation is to be applied on an EPCM project, representative(s) from proposed erection contractors should be consulted to assure effective integration of module issues and logistics. As the planning period for module design is typically well in advance of the BEA cycle for construction, it is necessary to perform this activity independently.
Benefits of innovation and efficiencies	With an EPC approach the owner has an integrated team accountable for delivering all facets of the project in a synchronous manner. It is advantageous for the EPC Contractor to foster innovations and efficiencies as any improvements between the E, P and C functions translates into most effective lowest costs project delivered in the shortest duration.	Contractors engaged in EPCM are at a disadvantage for the benefits of innovation as typically their focus is on the quickest completion of their contract scope. Willingness to accept new and innovative practices will usually be a by-product of improved fee potential. Incentives for innovations will be centred on a specific contract in lieu of a benefit to the total project.
Accountability for labour relations	EPC Contractors are responsible for the labour across the project. Effective and consistent application of labour relations is essential in maintaining respect with specialist personnel including the momentum that will deliver the project as expected.	Each contractor on an EPCM project will have their preference for labour relations and application of work assignments. In many cases these contractors will employ jurisdictional decisions that favour their operation without respect for affect to other project contractors. Owners may retain a labour consultant however it common practice for each contractor to be responsible.
Demand for Skilled Resources	An EPC contractor capable of executing substantial and complex scopes usually provides a good draw for skilled labour as the specialists view them as a stable source of work with consistent work rules. This can be critical when resources are challenged and innovative recruiting actions are necessary to meet the staffing plans for large and complex projects.	EPCM Contractors usually have good relationships with trade(s) sources as their smaller team is tailored for consistent employment through seasonal changes. This results in a strong draw for labour up to their capacity, however unless the project scope supports the dynamics of staffing multiple contractors, resource recruiting can be challenging with less manning for staffing issues.

Percentage for speciality work	An EPC Contractor is challenged executing high volumes of speciality work (e.g. insulation, roofing, pre-engineered buildings, containment liners) as both direct his specialists and the contractor's non-manual labour typically do not have the training required to install such components of systems. In such cases the EPC Contractor will hire specialty contractors to execute unique scopes of work	EPCM works well with speciality applications, where contractors possessing unique qualifications, custom tooling or particular licenses are best suited over a general contractor. The quality of work typically meets or exceeds industry standards, however schedule compression is unlikely as the administration of multiple speciality contractors is time and resource consuming.
Location of engineering team/s	Where the engineering and detailed design is performed should have minimal impact, if effective coordination and communication is established by the EPC Contractor. Efficient dialog is required early to assure constructability issues and lessons learned and incorporated in a timely manner.	EPCM can work effectively with remote engineering as contract documents should be based on a defined scope with clear bid specifications. Work can be executed in an EPCM regardless of the location of the design centre; however contractor expertise should be retained during the construction.
Management of local community and indigenous peoples	An established EPC Contractor with a formal labour relations program should be capable of executing an effective protocol for the hiring, training and involvement of local personnel. This includes developing agreements with labour leaders to provide access for indigenous people to the project and the use of non-signatory local contractors for portions of the work	Hiring local contractors can fulfil some indigenous issues however there can be uncertainty around these contractors having the skills and qualifications required for the project. With EPCM the managing contractor must validate the capabilities of local contractors to assure that owner or community commitments for local affairs do not significantly compromise project execution.
Build-Own-Operate-Transfer (BOOT) option	The BOOT option is being considered by more owners as plant development can proceed with innovative capital schemes. In a BOOT option a high degree of contractor accountability is required as the risk associated with traditional workmanship warranties is extended to include performance expectations over some period of an operating cycle.	BOOT applications are possible under an EPC'M contract, however it is more difficult and costly to align multiple contractors in a risk pattern that extends beyond mechanical completion of their specific contract. In addition, performance bonding of contractor can be a concern as for many the cost of extended risk exceeds their bond capability.

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